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ABSTRACT

This paper argues that the standard "When it is expected that a test will be used to make norm-referenced assessments of groups rather than individuals, normative data based on appropriate group statistics should be provided," which was considered secondary in the 1985 "Standards for Educational and Psychological Testing" and essential in the 1974 standards, should be considered conditional; that is, primary for some situations and secondary for others. When tests are to report building averages, it is better to use school or group norms rather than pupil norms. To support this assumption, two sets of data from standardized tests are compared: (1) data for pupil norms and school average norms for grades 2, 6, and 8 obtained from published norms tables for the Iowa Tests of Basic Skills, 1978; and (2) data for pupil norms and "small group" and "large group" norms obtained from the norms tables for the Stanford Achievement Tests, 1982. The results show that median pupil scores and the median school average scores are seldom the same. Illustrations show that distribution of school averages is considerably less variable than the distribution of pupil scores. A copy of the class average performance and its relationship to school average performance for a university economics course is attached. (JAZ)

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Pupil Norms or Norms for Building Averages: Which are Most Appropriate for Reporting Building Data and Other Summary Data?

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by

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Descriptors

Test Norms
Test Interpretation/Use
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TM 870 132

ABSTRACT

Pupil Norms or Norms for Building Averages: Which are Most Appropriate for Reporting Building Data and Other Summary Data?

The 1985 "Standards for Educational and Psychological Testing," which supersede the 1974 standards, state, "When it is expected that a test will be used to make norm-referenced assessments of groups rather than individuals, normative data based on appropriate group statistics should be provided. (Secondary)." This standard was "Essential" in the 1974 standards.

The author presents a comparison among pupil, building average, and group average norms and contends that the 1985 standard should be "conditional;" that is, primary for some situations and secondary for others. One set of norms, pupil norms, ought not be used for all normative reporting.

Pupil Norms or Norms for Building Averages: Which are Most Appropriate for Reporting Building Data and Other Summary Data?

Introduction

The 1985 Standards for Educational and Psychological Testing, which supersede the 1974 standards, state, "When it is expected that a test will be used to make norm-referenced assessments of groups rather than individuals, normative data based on appropriate groups statistics should be provided (Secondary)." This is Standard 4.5, page 34. A similar standard in the 1974 Test Standards was labeled "Essential."

An "Essential" label indicated that group norms should be used whenever the normative data available applied to the group to be described. The 1985 label, "Secondary", means, to quote the standards, "desirable goals, but are likely to be beyond reasonable expectation in many situations." Thus, the standard, previously labeled "Essential", which in the 1985 standards terminology would be called "Primary", is likely to be ignored. It appears that the label "Conditional" should have been assigned this standard. A "Conditional" standard is described as one which, "should be considered primary for some situations and secondary for others.

In the original 1983 draft of the new standards, this was standard 4.7 and read as follows:

STANDARD 4.7

Where it is expected that a test will be used to assess groups rather than individuals (i.e., for schools or programs), normative data based on appropriate group statistics should be provided. (B) (B = Conditional)

[COMMENT:]

It can be misleading to evaluate schools by using norms developed for the evaluation of individuals. Computed group means for nonlinear scales such as percentile ranks derived for individual norms can also yield misleading results.

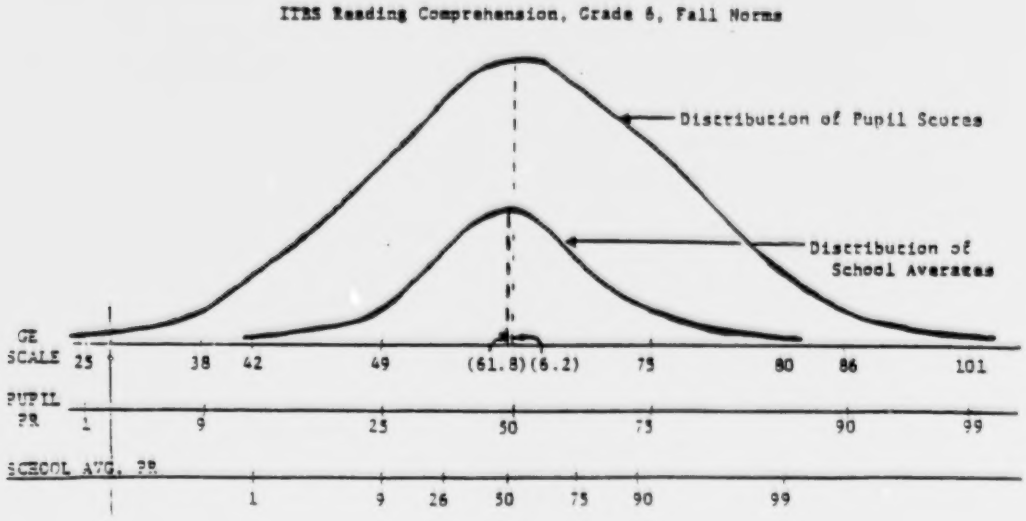
Current Practices

Current practices in reporting school test data vary by school district depending on the averages and availability of published norms. Since several publishers do not provide school average norms, pupil norms are used by many schools. When school average norms are available, above average schools tend to use them because the school average percentile rank is greater than the pupil percentile rank; below average schools tend to use pupil percentile ranks because they are greater (better) than school average percentile ranks.

Some districts and states use school average percentile ranks for reporting data for special groups such as Chapter 1, state averages, and population subgroups. Other districts and states report pupil percentile ranks. Some districts use medians and report pupil percentile ranks for school and district median scores.

Distributions for School (and Group) Averages and Pupil Scores

The distribution of averages is considerably less variable than the distribution of pupil scores. The illustration below is for Iowa Tests of Basic Skills, Grade 6, 1978 data and is taken from a paper in which the two types of norms were discussed.


ITBS Reading Comprehension, Grade 6, Fall Norms
Distribution of Pupil Scores
Distribution of School Averages
GE SCALE 25 38 42 49 (61.8)(6.2) 75 80 86 101
PUPIL PR 1 9 25 50 75 90 99
SCHOOL AVG. PR 1 9 26 50 75 90 99

Methods and Procedures

Data for pupil norms and school average norms for Grades 2, 6, and 8 were obtained from published norms tables for the Iowa Tests of Basic Skills, 1978 Edition. Data for pupil norms and "small group" and "large group" norms were obtained from the norms tables for the Stanford Achievement Tests, 7th Edition, Copyright 1982 by The Psychological Corporation (Harcourt, Brace, and Javonovich).

The Iowa Tests of Basic Skills norms for school average were developed by obtaining averages for each grade in each building in the national standardization sample. Approximately 350 buildings were in the Grades 1-6 sample and approximately 250 buildings were in the Grades 7 and 8 sample.

The Stanford norms for groups were also obtained from the national standardization sample. Within each grade all classes, buildings, and districts with fewer than 50 students were included in the "small group" norms and all classes, buildings, and districts with 50 or more students were included in the "large group" norms. Hence, some very small distri ts are included in the "small group" sample, probably with some classes from large districts.

Pupil percentile ranks, ITBS school average percentile ranks, and Stanford small group and large group average percentile ranks were obtained for selected scores for selected tests using the developmental standard score scale for each of the publisher's tests.

The tests selected were reading and math computation at Grades 2, 6, and 8, spelling at Grade 2, and Language Total at Grades 6 and 8. Reading was selected because most people are interested in reading data. Math computation was selected because it tends to be less variable than most tests because of the lock-step nature of instruction, particulary in the lower grades. Spelling was selected because it was a common test at Grade 2; Language Total was selected for Grades 6 and 8 to cover the three R's in the upper grades.

The data are reported in Table 1. Data for Grade 2 are reported first, and are followed by data for Grades 2 and 6. On each page of tables, data for the Stanford are reported at the top; data for the Iowa are reported below. The first table for each test has the national percentile rank on the left and the corresponding standard score in the body of the table. For example, for the Stanford, Grade 2, a pupil standard score of 698, a Small Group standard score of 621+ and a Large Group standard score of 611 are at the 99th percentile. This portion of each table gives you some idea of the range of scores for each norms group.

The table below, the second table for each test, has the standard scores for the least variable group in the margin and the corresponding percentile ranks of these standard scores for each group. For example, for Grade 2, Stanford, a standard score of 611+ is the 99th percentile on the Large Group norms, a 96th percentile on Small Group norms, and a 72.1 percentile on pupil norms.

Table 2 presents data for ITBS Grade 6 for 1978 and 1985 norms. The table is similar to the second table for each test in Table 1, but the standard score is not shown in the margin. This standard score is not shown because the 1985 standard score scale is not exactly the same as the 1978 standard score scale (as might be expected due to changes in student performance and differences in between-grade and within-grade variability). The percentile ranks are different between 1978 and 1985.

Last, Appendix A provides data on a college economics class.

Table 1

Pupil Percentile Ranks and Percentile Ranks for

Group Averages - Grade 2

Pupil, Small Group, and Large Group Scaled Score (SS) for Selected Percentile Ranks (PR)
Stanford Achievement Tests, Grade 2, Spring.

	Reading Comp. (SS)			Math Computation (SS)			Spelling Scaled Score (SS)		
PR	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group
99	698	621+	611+	690	621	597	701	617	600
90	644.6	601	598	628.8	597.5	585.5	638.2	595	587
75	615.1	590	586.5	593.6	581	577.5	605.6	582	576
50	580.4	575	574	561	566	565	569.5	563.5	564.7
25	538.3	557	561	529.3	549	552.5	536.2	549.5	553
10	495	537.5	548	500.5	532.5	543	505	534.5	541
1	447	507	525	460	508	525	459	511	524

Large, Group, Small Group, and Pupil Percentile Ranks for Selected Scaled Scores (SS)

	Reading Comprehension Percentile Ranks				Math Computation Percentile Ranks				Spelling Percentile Ranks			
SS	Large	Small	Pupil	SS	Large	Small	Pupil	SS	Large	Small	Pupil
611+	99	96	72.1	597	99	90	76.9	600	99	93	71.6
598	90	87	62.4	585.5	90	79.5	69.6	587	90	82	63
586.5	75	70	54.8	577.5	75	70	63.8	576	75	66	54.4
574	50	49	45.3	565	50	48	53.5	564.7	50	46.7	45.7
561	25	30	37	552.5	25	29	43	553	25	30	37.3
548	10	17	29.8	543	10	18	35.6	541	10	15	28.7
525	1	5	19.8	525	1	6	22.2	524	1	5	18.5

Pupil and School Standard Scores (SS) for Selected Percentile Ranks (PR)
Iowa Tests of Basic Skills, Grade 2, Spring.

	Reading Comp. (SS)		Math Computation (SS)		[illegible]lling (SS)	
PR	Pupil	School	Pupil	School	Pupil	Pupil
99	130	111	112	102	131	111
90	113	103.5	103.5	98.4	115	104
75	103.5	98.8	100.3	96.2	104.5	99.5
50	93	93.6	93.4	93.8	93.7	94.6
25	82.5	88.2	88	91.4	82.5	89.5
10	73	83.5	83	89.3	73	85
1	57	76	74	86	55	78

Pupil and School Percentile Ranks for Selected Standard Scores (SS)

	Reading Comprehension Percentile Ranks			Math Computation Percentile Ranks			Spelling Percentile Ranks		
SS	School	Pupil	SS	School	Pupil	SS	School	Pupil
111	99	87	102	99	86	111	99	86
103.5	90	75	98.4	90	73.6	104	90	74
98.8	75	64.6	96.2	75	64	99.5	75	64
93.6	50	51.8	93.8	50	52	94.6	50	52.2
88.2	25	38.4	91.4	25	40	89.5	25	40
83.5	10	27.5	89.3	10	30.5	85	10	30
76	1	14	86	1	18	78	1	17

Table 1 (Cont'd)

Pupil Percentile Ranks and Percentile Ranks for

Group Averages - Grade 6

Pupil, Small Group, and Large Group Scaled Score (SS) for Selected Percentile Ranks (PR)
Stanford Achievement Tests, Grade 6, Fall.

	Reading Comp. (SS)			Math Computation (SS)			Language Total (SS)		
PR	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group
99	782	695	690	757	692	688	749	704	694
90	718.3	679	677	706	671	670	707.5	678	676
75	686.7	667	664	677.8	659.5	659	683	667	666
50	651	653.5	652.3	648	647.3	647	656	657.3	656.3
25	618	639	640	618.5	635	635	628	645.5	645.5
10	593	624.5	628	594.3	623	626	603.5	633	636
1	561	600	606	564	604	610	568	607	618

Large, Group, Small Group, and Pupil Percentile Ranks for Selected Scaled Scores (SS)

	Reading Comprehension Percentile Ranks				Math Computation Percentile Ranks				Language Total Percentile Ranks			
SS	Large	Small	Pupil	SS	Large	Small	Pupil	SS	Large	Small	Pupil
690	99	97	77	688	99	98	81.7	694	99	97	83
677	90	88	69	670	90	89	68.8	676	90	88	69
664	75	70	60.2	659	75	74	60	666	75	72	60
652.3	50	47.7	51	647	50	49	49	656.3	50	47.7	53.7
640	25	27	41.6	635	25	25	37.2	645.5	25	25	39.5
628	10	13	31.6	626	10	13	30.5	636	10	13	31
606	1	2	16	610	1	3	18.8	618	1	3	18

Pupil and School Standard Scores (SS) for Selected Percentile Ranks (PR)
Iowa Tests of Basic Skills, Grade 6, Fall.

	Reading Comp. (SS)		Math Computation (SS)		Language Total (SS)	
PR	Pupil	School	Pupil	School	Pupil	Pupil
99	186	160	170	152	186	160
90	164	150	155	145.3	164	150
75	151.5	143.7	146.7	141.2	151	143.3
50	137.5	136.5	137.3	136.7	137	136
25	123	129.3	128	132	122.5	128.7
10	111	123	119.5	128	110	122
1	88	113	106	121	88	112

Pupil and School Percentile Ranks for Selected Standard Scores (SS)

	Reading Comprehension Percentile Ranks			Math Computation Percentile Ranks			Language Total Percentile Ranks		
SS	School	Pupil	SS	School	Pupil	SS	School	Pupil
160	99	86	152	99	86	160	99	86
150	90	73	145.3	90	71.7	150	90	73
143.7	75	61	141.2	75	60.6	143.3	75	61.7
136.5	50	48	136.7	50	48.1	136	50	48
129.3	25	35.6	132	25	35	128.7	25	35.4
123	10	25	128	10	25	122	10	24
113	1	12	121	1	12	112	1	12

Table 1 (Cont'd)

Pupil Percentile Ranks and Percentile Ranks for

Group Averages - Grade 8

Pupil, Small Group, and Large Group Scaled Score (SS) for Selected Percentile Ranks (PR)
Stanford Achievement Tests, Grade 8, Fall.

	Reading Comp. (SS)			Math Computation (SS)			Language Total (SS)		
PR	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group	Pupil	Small Group	Large Group
99	779	715	714	798	739	729	776	730	718
90	732.5	695	692	749.3	709.5	706	734.5	704.5	699
75	703	681.5	680	716.7	695	694	710	690	687
50	672	666.5	666.5	685.7	681	681	682	676	676
25	643	651	653	657.8	666.5	668	655	662	664.5
10	618	634.5	640	636	652.5	658	632	647	654
1	583	609	617	600	629	642	596	621	637

Large, Group, Small Group, and Pupil Percentile Ranks for Selected Scaled Scores (SS)

	Reading Comprehension Percentile Ranks				Math Computation Percentile Ranks				Language Total Percentile Ranks			
SS	Large	Small	Pupil	SS	Large	Small	Pupil	SS	Large	Small	Pupil
714	99	98	82.4	729	99	97	82	718	99	96	81
692	90	87	67.3	706	90	87	67.4	699	90	85	66
680	75	73	57	694	75	74	58	687	75	70	54
666.5	50	50	45	681	50	50	46	676	50	50	43
653	25	28	33.3	668	25	27	33.8	664.5	25	29	31.8
640	10	14	23	658	10	15	25.2	654	10	16	23
617	1	3	9.5	642	1	5	13.6	637	1	5	12

Pupil and School Standard Scores (SS) for Selected Percentile Ranks (PR)
Iowa Tests of Basic Skills, Grade 8, Fall.

	Reading Comp. (SS)		Math Computation (SS)		Language Total (SS)	
PR	Pupil	School	Pupil	School	Pupil	Pupil
99	225	193	214	190	232	195
90	197	182.5	195	180.5	202	183
75	182	174	183	173.7	185.5	174
50	165.5	165.3	167	166.5	166	165
25	148	157	152	159.3	147	155.5
10	133	149	138	152.5	131	147
1	108	138	114	143	100	135

Pupil and School Percentile Ranks for Selected Standard Scores (SS)

	Reading Comprehension Percentile Ranks			Math Computation Percentile Ranks			Language Total Percentile Ranks	
SS	School	Pupil	SS	School	Pupil	SS	School	Pupil
193	99	87	190	99	85	195	99	85
182.5	90	75.5	180.5	90	71.5	183	90	72
174	75	64	173.7	75	61.4	174	75	61
165.3	50	49.6	166.5	50	49.5	165	50	49
157	25	37	159.3	25	37.6	155.5	25	35.5
149	10	26	152.5	10	25.5	147	10	25
138	1	14	143	1	15	135	1	13

Table 2

Selected School Average Percentile Ranks and Corresponding 1978 and 1985 Pupil Percentile Ranks, Grade 6

Iowa Tests of Basic Skills

Reading Comprehension

Percentile Ranks

School	1978 Pupil	1985 Pupil
99	86	88
90	73	74
75	61.7	63.6
50	48	53.2
25	35.4	41.1
10	25	30
1	12	16
Math Computation		
99	86	87
90	71.7	72
75	60.6	60.4
50	48.1	50.4
25	35	38
10	25	26
1	12	12
Language Total		
99	86	88
90	73	75
75	61.7	65
50	48	53.6
25	35.4	41.6
10	24	32
1	12	19

Discussion

The tables clearly show that when pupil PR's are used to report average data for achievement tests, the range of PR's is about 10 to 90. There are some differences from grade to grade, test battery to test battery, and test to test. It is unlikely that any school of any size (excluding schools with 1 to 10 students) in the United States will be at or even near the 99th percentile or the 1st percentile when pupil norms are used with school average data.

It is also quite clear why above average districts and schools use school average percentile ranks with average scores--it can be shown that some schools are at the 95th to 99th percentile compared to other schools in the country--and why low scoring schools use pupil PR's--no schools are reported as being at the first percentile! There is a bit of irony in the latter practice: Pupils can and do receive pupil PR's that are at the 1st percentile, but schools are never at PR = 1!

The tables also show that the median pupil score and the median school average score are seldom the same. This is not unexpected. When one considers the sociological, political, and economic aspects of school and district reorganization, the differences in school sizes by region of the country and by district size, and differences in level of achievement in rural, urban, and suburban schools, one would expect distributions of averages to differ quite markedly from pupil distributions. Very small poor schools that nobody wants and very large, large city schools are very likely heavily represented in the lower half of the distributions. Suburban schools which tend to be intermediate in size, private schools, and high-scoring small districts from typically high-scoring states (e.g., Minnesota, which has high ACT and SAT scores, but has a large number of school districts with relatively small buildings) are probably heavily represented in the top of the distribution.

Hence, one might expect some skewness in the distribution of school averages and, since pupil norms are more-or-less normally distributed, some differences between school average medians and pupil medians.

The Grade 6 Reading Comprehension distributions for the ITBS 1985 pupil norms and school norms are shown in Figure 2. These are plotted on normal probability paper. The solid lines show the actual distributions, the dotted lines show a normal distribution. The distribution of school averages is somewhat irregular and is skewed more at the bottom of the distribution than the top or either end of the pupil distribution. Had the 1978 distributions been plotted, the distributions would have been similar, but the median of the 1978 school averages would have been slightly below the pupil median.

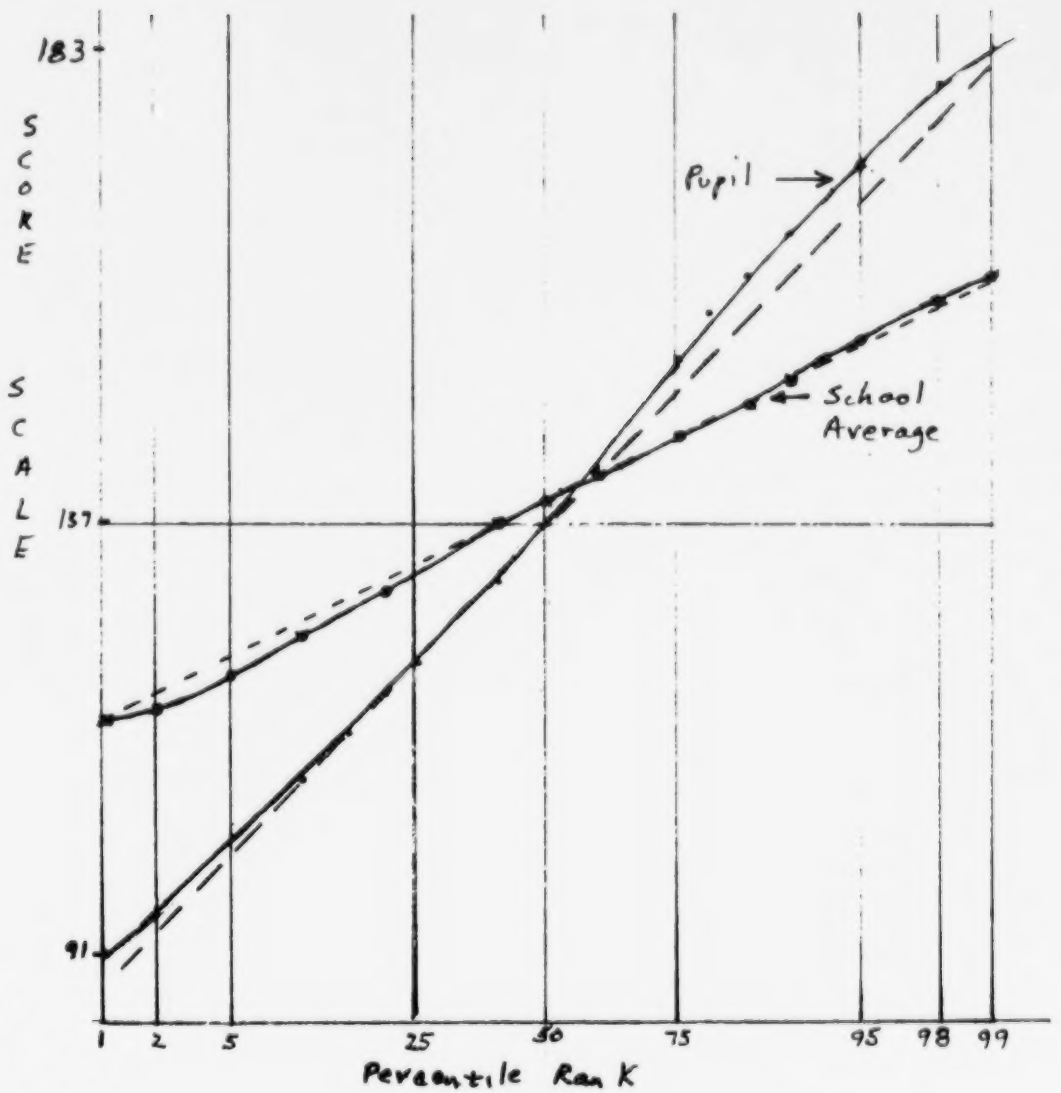
The economics class and pupil data are summarized in Appendix A.

FIGURE 2

ITBS Grade 6, Reading Comprehension

Pupil and School Average Distributions

Plotted on Normal Probability Paper



Implications for Test Interpretation

If a test interpreter is trying to provide information about the national rank of a building, clearly school norms (or a stanford group norm) should be used. Why? First, because such norms yield PR's from 1 to 99. Second, because even at the median, pupil and school norms differ.

There may be another good reason for using school or group norms: These norms reflect groups that change in both size and composition in Grades 1-12, very likely in a different manner than pupil norms do. Several elementary schools feed middle schools or junior high schools, several middle schools feed high schools. At or near the median this probably will not make much difference in the pupil of school norms. However, for schools well above or well below the average, factors related to school dropouts and retention are more likely to have an effect on pupil norms than on school norms in Grades 9-12.

Pupil norms are based on pupils that stay in school. Dropout rates differ considerably from school to school, but low-scoring schools tend to have many dropouts, whereas high-scoring schools tend to have few dropouts. Hence, pupil norms for Grades 8 or 9 through 12 do not include many low scoring students included in the pupil norms for Grades 1 to 7 or 8. In a sense, the pupil norms for Grades 8 or 9 through 12 are "tougher" norms than the Grades 1 to 7 or 8 norms. This might explain why, when pupil norms are used for high-scoring schools (or states), the PR's follow the pattern shown below.

	Grade 2	Grade 5	Grade 8	Grade 11
High Scorer	75	75	74	71
Low Scorer	25	25	26	30

In short, when pupil norms are used with averages, one might expect the pupil PR reported to converge toward the median pupil PR as you move from Grades 7 or 8 to Grade 12--a special sort of regression toward the median due to the dropouts. This is less likely to be true of school norms because they reflect averages for schools that probably have a more similar dropout rate between Grades 8 and 12 and, hence, stay at the same relative position among schools. Schools at or near the 95th percentile on school norms all have relatively few dropouts. But, the Grades 8-12 pupil PR's in the 70-80 range (comparable to a school average PR of 95) are "tougher" compared to norms for earlier grades because more low-scoring pupils than high-scoring pupils dropped out of the pupil population. The remaining pupils in low-scoring schools have "improved" their average scores because the lowest scoring pupils dropped out. The "improvement" would reflect itself in the pupil norms, but probably would not do so in school norms because all schools like them had similar dropout rates and, hence, these schools stay at the same relative position in the distribution of schools.

It is difficult to test this hypotheses. Real data from relatively small districts all of which had one building in all grades would probably be the best source of real data. Another possibility is a similation study with several dozen "buildings" with a range of average scores in Grades 6-7 (just to get a base), a few dropouts in Grade 8, and "dropping-out" different numbers of students at various score levels depending on the "building" in question. Dropouts from very high-scoring schools might be in the 4-7% in Grades 9-12 range, scattered over the entire range, whereas dropouts from the lowest scoring schools might be in the 25-35% range by Grade 10, with perhaps 2/3 of these dropouts coming from the lower half of the Grade 7 distribution.

Cautions

There are no norms for school districts. So norms for schools are often used with school districts. From the Stanford data for small and large groups, it is quite evident that "district norms" would be somewhat less variable than school norms. Nevertheless, district norms *are* more similar to school norms than pupil norms. Hence, people that use school norms to report district data provide reasonably accurate information about the relative rank of the district. For high-scoring districts, the district percentile rank is somewhat greater than what is reported; for low-scoring districts, the district percentile rank is less than what is reported.

In the Iowa Tests of Basic Skills Manual for School Administrators, the following statement is provided (page 31).

> Strictly speaking, these norms (school norms) should not be used in interpreting school system or district averages. For the latter purposes, norms for system averages are needed. However, in a national standardization program, it is impracticable...(to obtain dependable norms for school averages). Such averages would, of course, be somewhat less variable than school norms. *When school norms are used to interpret system averages, this limitation should be recognized.* (Underlined is italicized.) Ranks for high-scoring systems are somewhat underestimated; ranks for low-scoring systems are somewhat overestimated.

School norms should *not* be used with state reports and reports for special groups (e.g., Title I, racial-ethnic groups, etc.), in this writer's opinion. So, what do you use? Pupil norms are probably the best bet, but it should be made clear that this is a *pupil* percentile rank of the average that does not provide truly normative information.

APPENDIX A

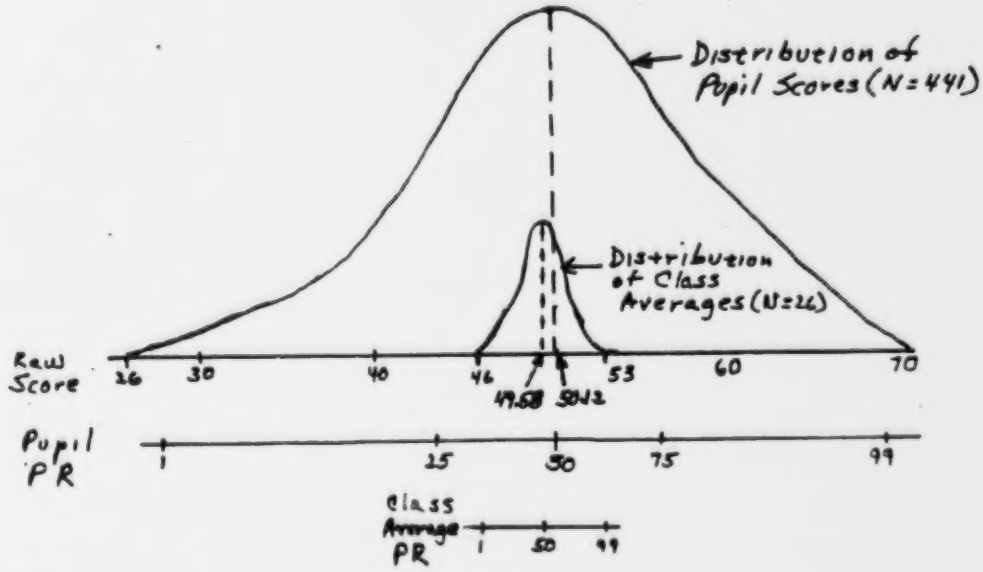
Class Average Performance and its Relationship to School Average Performance

As I was leaving a final examination last December, I noticed that the scores for a basic economics class had been posted. In addition to the statistics for all students enrolled in Economics 6:2, a frequency distribution and many other statistics were reported for each section--in keeping with large university examination's service efficiency and overkill. I copied down pertinent statistics because I believed that the information reported would provide a useful analogy to school average norms, which we provide for many of our standardized tests. The data are at the left side of this paper, reordered from high to low.

One should keep in mind that the typical large university class section is not subject to the same sort of variables that elementary and high school averages are. First, the group is less variable than a elementary or high school population. Second, students are assigned more or less randomly to sections. (To be sure, some students such as athletes and work-study students are given preferential treatment, but even these students tend to be assigned more or less randomly in the morning classes.) Third, performance in basic business classes is intense because success will allow one to enter or be denied entrance into more advanced classes.

Econ 6:2
Fall

N	Mean
9	52.89
26	52.85
22	52.80
20	52.67
26	52.00
18	52.00
17	51.76
12	51.59
22	51.33
12	51.17
13	50.83
13	50.42
12	49.60
20	49.56
16	49.38
24	49.28
18	49.25
7	49.00
16	48.88
9	48.50
9	48.00
14	47.44
20	47.11
24	46.96
21	46.39
21	46.36
441	



Pupil Mean=49.96
Pupil SD = 8.18
Pupil Median=50.12
Range=26 to 70

Mean of the Means=49.92
SD of Class Avg.=2.17
Median Class Avg.=49.58
Range=46.36 to 52.89

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